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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/925,195	08/09/2001	Yue Ma	NDSP-P004	4431

20575 7590 07/15/2004

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EXAMINER	
TUCKER, WESLEY J	

ART UNIT	PAPER NUMBER
2623	4

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/925,195	MA ET AL.	
	Examiner	Art Unit	
	Wes Tucker	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 August 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 13- 14, 17-18, 31-32, 37-47, and 49-50* is/are rejected.

7)☒ Claim(s) *2-12,15,16,19-30,33-36 and 48* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 13, 17-18, 31, 37-44, 46-47, and 49-50 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,832,143 to Suga et al.

With regard to claim 1, Suga discloses for an image to be re-sampled, a method of performing spatial interpolation at a pixel position of a re-sampling line, said pixel position immediately below pixel x[0] of a first line comprising pixels x[-n] to x[n], said pixel position also immediately above pixel y[0] of a second line comprising y[-n] to y[n] (Figs.16 and 18).

Suga further discloses for k = 0 to 2n, assigning a numerical value A[k] to a direction D[k] that is established as a possible interpolation direction intercepting x[-n +k], said pixel position, and y[n - k], wherein said A[k] is defined for indicating the likelihood of an edge crossing said pixel position along said D[k] by quantifying the degree of similarity between a pixel segment seg[k,x]= {x[-n+k -c], . . . , x[-n +k +c] } from said first line and a pixel segment seg[k,y]={y[n - k -c], ..., y[n - k +c]} from said

second line, said first and said second segments approximately symmetric about said pixel position (Fig.18, element S4 and column). Here the direction D[k] is interpreted in Suga as the direction identified for optimum interpolation and A[k] is identified with T[k]. The pixel segments are shown in Fig. 16.

Suga further discloses selecting from D[0] to D[2n] a first direction D[m] whose assigned A[m] indicates the highest likelihood of an edge crossing said pixel position along said D[m] (Fig.18, element S4 and column).

Suga further discloses performing a segment analysis on a symmetric segment pair seg[m,x] and seg[m,y] associated with D[m], said segment analysis adapted to verify said symmetric segment pair as belonging to an edge crossing said pixel position, said seg[m,x] and seg[m,y] symmetrically located with respect to said pixel position (Figs. 16 and 18 and column 3, lines 1-8). Here Suga explains that the technique of using multiple directions for interpolating pixels is done in order to better determine the interpolated pixels value in view of edges.

Suga further discloses in response to said D[m] having been verified by said segment analysis, performing spatial interpolation at said pixel position along said D[m] (Fig.18, element S5).

With regard to claim 13, Suga discloses the method claim 1, further comprising the step of having failed said segment analysis test, performing spatial interpolation at said pixel position along a default interpolation direction (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the

interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

With regard to claim 17, the claim is interpreted as a description of the slope of the interpolation direction line as it is rotated. Suga discloses the same line slope setup (Fig.16). Suga further discloses performing a post processing by adjusting the interpolated value of said pixel position according to the interpolated value of said pixel position and the pixel values of pixels neighboring said pixel position (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

With regard to claim 18, the discussion of claim 1 applies. Suga discloses a system with the method discussed in claim 1 (Fig.13).

With regard to claim 31, Suga discloses the system of claim 18, wherin said interpolating unit is adapted for performing spatial interpolation at said pixel position along a default interpolation direction in response to said D[m] having failed said verification by said segment analysis unit (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

With regard to claim 37, the claim is interpreted as an explanation of the slope of the interpolation or directional line. Suga discloses the same kind of line passing through so many directions intersecting the pixel to be interpolated (Fig. 16).

With regard to claim 38, Suga discloses a post processing unit for performing post processing by adjusting the interpolated value of said pixel position according to the interpolated value of said pixel position and the pixel values of pixels neighboring said pixel position (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

With regard to claim 39, Suga discloses a method for performing spatial interpolation at a pixel position on a resampling line of an image to be re-sampled, (Figs. 16 and 18).

Suga further discloses establishing a plurality of possible interpolation directions intercepting at said pixel position by using a first plurality of pixels from a first line immediately above said resampling line, and by using a second plurality of pixels from a second line immediately below said resampling line (Fig.16).

Suga further discloses for each of said plurality of possible interpolation directions, quantifying the likelihood of each said possible interpolation direction for being an interpolation direction to be used by assigning a numerical value to each of said

plurality of possible interpolation directions (Fig. 18, element S4). Here the correlations determined by k are used to select the line direction for interpolation.

Suga further discloses from said plurality of possible interpolation directions, selecting an interpolation direction that has a minimum assigned value (Fig. 18, element S4). Here the optimum interpolation direction is chosen according to a k value that minimizes T(k).

Suga further discloses performing a plurality of verifications to rule out erroneous selection of said selected interpolation direction (Fig.18, element S9). Here Suga discloses determining if interpolation is proper by comparing values for the completed interpolated line of pixel values in step S7.

Suga further discloses performing spatial interpolation along said selected interpolation direction if said selected interpolation direction passes said plurality of verifications (Fig.18, elements S6-S10). Interpolation is performed according to the selected direction unless it is determined to be improper in which case, the pixel value is replaced by an alternate interpolation direction.

With regard to claim 40, Suga further discloses the method of Claim 39, further comprising the step of performing spatial interpolation along a default interpolation direction intercepting said pixel position if said selected interpolation direction does not pass said plurality of verifications (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

With regard to claim 41, Suga discloses a method for rendering an edge having a non-zero slope that intercepts a pixel position of a resampling line in an image to be resampled (Figs. 16 and 18).

Suga further discloses detecting said edge along a plurality of pre-defined directions intercepting effectively at said pixel position by selecting a pre-defined direction based on a numerical ranking assigned to said plurality of pre-defined directions, wherein each of said pre-defined directions has a non-zero slope (Figs.16 and 18). The numerical ranking is interpreted as the k value and the function of T(k).

Suga further discloses verifying said selected direction for performing spatial interpolation at said pixel position using pixels that lie along said selected direction (Fig.18, element S9). The determination of whether the interpolation is proper is made.

Suga further discloses in response to said selected direction passes said verifying step, performing spatial interpolation at said pixel position using pixels that lie along said selected direction (Fig.18, elements S5-S10). The pixel is interpolated according to the direction selected and if the interpolation is deemed proper then the interpolated value is used.

With regard to claim 42, Suga discloses the method of Claim 41, further comprising the step of in response to said selected direction not passing said verifying step, performing spatial interpolation at said pixel position using pixels that lie along a default interpolation direction, said default interpolation direction intercepting said pixel position (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is

determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

in response to the selected interpolation direction passing all verifications, performing spatial interpolation along said selected interpolation direction (Fig.18,element S9).

With regard to claim 44, Suga discloses the method of claim 43, further comprising the step of: in response to the selected interpolation direction disqualified by any of the verification tests, performing spatial interpolation along a default interpolation direction (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

With regard to claim 46, Suga discloses the method of claim 43, wherein each of

With regard to claim 43, Suga discloses a method for re-sample an image by spatial interpolation (Fig. 18), said method comprising the steps of:

assigning a numerical value respectively to n pre-defined interpolation directions that intercept effectively at a pixel position in a resampling line, forming respectively non-zero angles with said resampling line (Figs. 16 and 18, elements

said n numerical values is generated using pixels values from segments above and below

the pixel to be interpolated (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

With regard to claim 47, Suga discloses the method of claim 43, wherein the assigned numerical value of said selected interpolation ranks as the smallest among said n numerical values (Fig. 18, element S4). Here the optimum interpolation direction is chosen according to a k value that minimizes T(k).

With regard to claim 48

With regard to claim 49, Suga discloses a system for image resample by spatial interpolation (Fig. 13).

Suga further discloses an evaluation unit adapted to assign a numerical value to each of a plurality of pre-defined interpolation directions that intercept effectively at a pixel position in a resampling line of said field (Figs. 16 and 18).

Suga further discloses a selection unit coupled to said evaluation unit, said selection unit adapted to select an interpolation direction from said plurality of pre-defined interpolation directions by ranking said plurality of assigned numerical values (Fig. 18, element S4).

Suga further discloses a segment analysis unit comprising a plurality of verification units coupled to said second unit, said verification units adapted to eliminate erroneous selection of said selected interpolation direction (Fig. 18, element S9 and S10

and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

Suga further discloses an interpolation unit coupled to said unit, wherein said interpolation unit is adapted to perform spatial interpolation at said pixel position along the selected interpolation direction in response to the selected interpolation direction passing all verifications (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it. If the interpolation is proper, the interpolation in the selected direction is maintained.

With regard to claim 50, Suga discloses the system of claim 49, wherein said interpolation at said pixel interpolation at said pixel position along a default interpolation direction in response to the selected interpolation direction (Fig. 18, element S9 and S10 and column 6, lines 55-65). If the interpolation is determined to be improper the interpolated pixel value is replaced by an interpolation of the pixels directly above and below it.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 14, 32, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,832,143 to Suga et al.

With regard to claim 14, Suga discloses the method of claim 13, but does not disclose having a default angle of interpolation of 45 degrees. It is understood that the angle of default direction for interpolation is a matter of design choice and can be chosen for any angle deemed appropriate. Therefore it would have obvious to one of ordinary skill in the art at the time of invention to use any default interpolation direction determined appropriate in order to better interpolate the pixel values.

With regard to claim 32, the discussion of claim 14 applies.

With regard to claim 45, the discussion of claim 45 applies.

Allowable Subject Matter

Claims 2-12, 15-16, 19-30, 33-36, and 48 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Prior Art

Other prior art considered pertinent, but not relied upon is as follows:

U.S. Patent 5,513,281 to Yamashita et al. discloses an interpolation method for interpolating pixels between lines using different interpolation directions.

U.S. Patent 5,602,654 to Patti et al. discloses an interpolation method for interpolating pixels between lines using different interpolation directions.

U.S. Patent 6,262,773 to Westerman discloses interpolation between lines in video images using edge correlation.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wes Tucker whose telephone number is 703-305-6700. The examiner can normally be reached on 9AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703)308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Wes Tucker

7-9-2004

Jon Chang
Primary Examiner